AMENDED SPECIFICATION

Reprinted as amended in accordance with the Decision of the Superintending Examiner acting for the Comptroller General dated the third day of April 1968, under Section 14, of the Patents Act, 1949.

PATENT SPECIFICATION

908,217

908,217

DRAWINGS ATTACHED

Inventors: HAROLD ROSE and NORMAN FRANCIS SARSFIELD

Date of filing Complete Specification: Oct. 23, 1958.

Application Date: Oct. 24, 1957. No. 33197/57.

Complete Specification Published: Oct. 17, 1962.

Index at acceptance:—Class 140, A2(C:E:G:K1C), A5(B:D:F), A5G(5:7:8:9), A(6:8:11A:12), E1(A:H).

International Classification:—B29d. C14c. D06m. D07h.

COMPLETE SPECIFICATION

Improvements in or relating to Sheet Materials

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ERRATUM

SPECIFICATION No. 908,217

Page 3, line 58, *for* "noes" *read* "does"

THE PATENT OFFICE
4th September 1968

to the fabric being between 60—80 British Standard mesh and one eighth of an inch mean diameter, passing the travelling web with the distributed discrete nodules past means for heating the nodules of resin so as to soften them sufficiently to cause them to adhere to the fabric to form a layer of discrete nodules which layer does not substantially affect the porosity or flexibility of the fabric, and allowing the nodules to cool.

By the term 'fabric' as used in this Specification is meant a porous fibrous sheet material constituted by a woven textile fabric, to bond it to the supporting sheet and at the same time to bring it to the "A" stage of curing. This is sufficient to cause the nodules to soften and to bind to the support. The completion stage of the cure, namely the "B" stage, is used also to laminate the interlining material with another cloth or other sheet material.

However, for most purposes it is preferred to employ a thermoplastic resin and preferably the resin should be such that it softens and the nodules bind to the support material within about ten seconds at a temperature

[*Price 4s. 6d.*]

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COMPLETE SPECIFICATION

Improvements in or relating to Sheet Materials

We, STAFLEX COMPANY LIMITED of Staflex House, Bainbridge Street, London, W.C.1., a British Company, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to an interlining material suitable *inter alia* for use in laminating with fabric and other sheet material.

An object of the present invention is to provide a method of forming interlining material in sheet form which does not substantially affect the porosity and handling characteristics of the support base carrying the fusible component.

According to the present invention a method of producing an interlining material comprises the steps of continuously passing a web of fabric as herein defined beneath means for distributing nodules of synthetic resin over the surface of the fabric in spaced relationship, the nodule size at the time of application to the fabric being between 60—80 British Standard mesh and one eighth of an inch mean diameter, passing the travelling web with the distributed discrete nodules past means for heating the nodules of resin so as to soften them sufficiently to cause them to adhere to the fabric to form a layer of discrete nodules which layer does not substantially affect the porosity or flexibility of the fabric, and allowing the nodules to cool.

By the term 'fabric' as used in this Specification is meant a porous fibrous sheet material constituted by a woven textile fabric, a felted textile fabric, or the material commonly known as 'bonded fibre fabric' which consists of natural or synthetic fibres laid at random, parallel or cross laid and bonded by a resin or other bonding agent, or a glass fibre textile which is either woven or bonded.

The resin used may be thermoplastic or thermo-setting and the term "resin" in the Specification and claims includes vinyl compounds having the general formula $CH_2=CHR$ where R is a halogen atom or an aryl radical or an aliphatic acyl radical, examples of such resins being polyvinylchloride, polystyrene, polyvinylacetate and conjoint polymers thereof, natural resins, ethylene polymers, derivatives of cellulose, synthetic or natural rubber or derivatives thereof, polyamides and polyurethanes or mixtures thereof with or without plasticisers or softening agents, which will soften under the conditions described hereinafter.

Where a thermosetting resin is employed heat may be employed to soften the resin to bond it to the supporting sheet and at the same time to bring it to the "A" stage of curing. This is sufficient to cause the nodules to soften and to bind to the support. The completion stage of the cure, namely the "B" stage, is used also to laminate the interlining material with another cloth or other sheet material.

However, for most purposes it is preferred to employ a thermoplastic resin and preferably the resin should be such that it softens and the nodules bind to the support material within about ten seconds at a temperature

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in the range of 80—180°C. It is in any event in the case of textile fabrics undesirable to employ a resin which does not behave in this manner after a maximum period after such application of 30 seconds at 200°C. since this temperature is the safe maximum temperature that can be used without scorching most fabrics.

After the nodules have been applied to the cloth, for example by scattering, by using mechanical or by other means, they are subjected to the action of heat which may be applied by passing the cloth or other support over, under or through steam plates or drums or by subjecting the surface of the support to radiant heat, for example by infra-red lamps, or heat may be applied by convection currents or any other suitable means. The degree of heating should be such that the nodules of resin soften so as to be firmly bonded to the supporting surface.

When the supporting sheet is a woven fabric of staple fibre it may be necessary to treat the cloth first of all to a raising action so as to lift the fibres. This prevents the resin from striking through to the reverse side of the material with consequential undesirable results.

After the nodules have been softened the cloth may be passed beneath a drum for pressing the nodules firmly into contact with the cloth and if desired the drum may be cooled, for example by water, so as to produce a rapid chilling action on the nodules to prevent any subsidiary tackiness.

An example of the invention will now be described with reference to the accompanying drawing which shows diagrammatically an apparatus suitable for carrying out the process.

Cotton fabric 1 is fed through the machine from a delivery roll the fabric having a weave count of 68 × 58 and a yarn count of 38's/42's and a basic weight of 2.2 ounces per square yard. The resin is polyethylene marketed under the trade name Alkathene grade 2 of of 60—80 British Standard mesh size prepared by granulating or comminutting polyethylene rod, sheet, tube, or other lump material and is fed from a hopper 3 onto the cotton fabric web 1. The nodules are heaped behind a knife blade or doctor knife 2 which depresses the cloth while the cloth passes under the doctor knife. The resin is transferred to the cloth from the hopper 3 having a controlled delivery at such a rate as to give a coating rate of 1.5 ounces per square yard. The rate of delivery is determined by the cloth speed, the contour of the knife blade and the pressure which the latter exerts against the cloth. In this example the linear speed of the cloth is 10 yards per minute and the blade is $\frac{3}{8}$" thick tapering down to a radiused edge having a diameter of $\frac{1}{16}$". Other speeds of cloth and doctor blade contours can however be used according to the nature of the cloth used, the particular flow properties of the particles and the weight of distribution required.

The coated fabric is then passed over a flat hot plate 4 steam or electrically heated to a temperature of 130°C. The cloth maintains a light contact with this hot plate 4. The coated fabric is in addition heated from above by an infra red heat source 8 supplying approximately 1 kilowatt per square foot of fabric surface. The distance of the infra red heating unit from the cloth is regulated so that the resin nodules are softened and begin to adhere to the fabric.

While the resin is in a soft heated condition it is subject to a degree of compacting in order to anchor the resin particles to the base material. The preferred method of effecting this is to pass the cloth under a water cooled steel roll 5 with a highly polished surface and which rests on the fabric stretched over two guide rolls 6. The roll is counter weighted so that the pressure can be controlled. The water-cooled roll also serves to fix any soft loose particles or nodules to the cloth which have not been sufficiently keyed to the cloth by the earlier heating process. This final compacting is necessary to avoid any loose particles or nodules dusting off. The water cooled roll also serves to cool the resin sufficiently to prevent further flattening or distortion or sticking of the nodules in the nip of the rolls 7 which provide the positive drive in drawing the fabric through the coating machine.

The pressure from the water cooled roller must be sufficient to procure adhesion without forcing the softened resin into the interstices of the cloth. The coated cloth is then subjected to atmospheric cooling for a distance of 2—4 feet, after which it may safely be rolled onto the take-up roller of the machine. At this stage normal handling of the cloth will not remove any of the resin nodules.

As a further example of suitable nodules for use in the process of the present invention a synthetic rubber/resin composition is used having the following composition:

	Parts by weight
'Vinylite' (Regd. Trade Mark) resin VMCH	50
Butadiene acrylonitrile rubber ('Hycar' Regd. Trade Mark) 1411)	50
Diethyl-hexyl phthalate	20

This composition is prepared on a rubber mill and subsequently granulated or comminuted when in a cold condition to the nodule size range of 20—30 British Standard mesh. The cotton fabric in this example can have a weave count of 42 × 36 and a yarn count of 24's/14's. weighing 3.2 ounces per

square yard. The doctor in this case is so adjusted as to give a weight distribution of the resin rubber composition of 1.5 ounces per square yard.

The sheet material prepared in accordance with the present invention is prepared by using a nodule size at the time of application to the support in the range 60—80 British Standard mesh to $\frac{1}{8}$" mean diameter.

The invention also includes the method of laminating material the subject of the present invention with another material, the method comprising applying the material of the present invention to a surface of the other material with the nodules against the surface of the other material and subjecting the said nodules to heat and whilst the nodules are in a softened condition applying pressure to the laminated material.

In copending Application Number 33,196/57 (Serial No. 908,216) there is described and claimed a method of producing an interlining material in which the initial resin material comprises nodules in which each nodule comprises a cluster of particles of resin only partially coalesced together, subsequent heat causing the cluster of particles to coalesce to form a rounded nodule adhered to the flexible material.

In Patent Specification No. 850,791 there is described and claimed a method of applying to a fabric, which is disposed in a gaseous medium such as air, a substantially water insoluble polymeric material by means of spraying or dusting so that the polymeric material adheres to the fabric in the form of discrete particles, heat and, if desired, pressure being applied to make the material adhere to the fabric in the form of discrete particles. It is further claimed that the polymeric material may be in powder form and soften without decomposition at a temperature between 100° and 200°C.

WHAT WE CLAIM IS:—

1. A method of producing an interlining material comprising the steps of continuously passing a web of fabric as herein defined beneath means for distributing nodules of synthetic resin over the surface of the fabric in spaced relationship, the nodule size at the time of application to the fabric being between 60—80 British Standard mesh and one eighth of an inch mean diameter, passing the travelling web with the distributed discrete nodules past means for heating the nodules of resin so as to soften them sufficiently to cause them to adhere to the fabric to form a layer of discrete nodules which layer noes not substantially affect the porosity or flexibility of the fabric, and allowing the nodules to cool.

2. A method as claimed in claim 1 in which the resin nodules distributed upon the fabric are subjected to a maximum temperature of 200°C. for a maximum period of thirty seconds.

3. A method as claimed in claim 2 in which a plasticised thermoplastic resin is employed and the nodules upon the fabric are heated to a temperature in the range of 80—180°C. for a maximum period of ten seconds to soften the nodules and cause their adherence to the fabric.

4. A method as claimed in any of the preceding claims wherein the resin is a vinyl compound having the general formula $CH_2=CHR$ where R is a halogen atom or an aryl radical or an aliphatic acyl radical.

5. A method as claimed in claim 4 in which the resin comprises one or more of the following, namely polyvinyl chloride, polystyrene, polyvinyl acetate or conjoint polymers thereof.

6. A method as claimed in any of the preceding claims in which after the application of heat the fabric with the adhered discrete nodules is passed past means for applying pressure to the softened nodules in the direction of the surface of the fabric to compact the nodules.

7. A method as claimed in any of the preceding claims wherein the fabric after passing the heating means is passed past means for chilling the heated and softened nodules.

8. A method as claimed in claims 6 and and 7 in which the fabric is passed beneath a chilling roller which serves both to compact the nodules and to chill them.

9. A method as claimed in claims 1 to 8 in which the nodule size is of the range 20—30 British Standard mesh.

10. A method as claimed in claims 1 to 8 wherein the nodule size is of 60—80 British Standard mesh.

11. A method as claimed in any of the preceding claims in which the heating means comprises infra-red lamps disposed above the surface of the fabric.

12. A method as claimed in any of the preceding claims in which the heating means comprises a flat hot plate heated by steam or electrically to a temperature of 130°C. the fabric being passed over the hot plate in light contact therewith.

13. A material whenever produced in accordance with the method claimed in any of the preceding claims and comprising a fabric having adhered upon one or both surface distributed discrete nodules of a plasticised synthetic resin which can be subjected to softening by heat and which has its porosity and flexibility characteristics substantially the same as the initial fabric.

14. A method of laminating material as claimed in claim 13 with another material comprising applying the material to a surface of the other material with the nodules being against the surface of the other material

and subjecting the said nodules to softening by heat and whilst the nodules are in a softened condition applying pressure to the materials.

15. A method of making a reinforcing material substantially as described with reference to the accompanying drawing.

16. A method of making a reinforcing material in accordance with the examples.

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PROVISIONAL SPECIFICATION

Improvements in or relating to Sheet Materials

We, STAFLEX COMPANY LIMITED of Staflex House, Bainbridge Street, London, W.C.1, a British Company do hereby declare this invention to be described in the following statement:—

This invention relates to an interlining sheet material suitable for use in laminating with fabric and other sheet material.

Heretofore interlining material suitable for laminating with and reinforcing fabric and other sheet material has taken two forms. It has consisted either of a textile fabric some or all of the constituent fibres of which are capable of being softened and in use welded or fused to a textile fabric or other sheet material superimposed thereon, or of a textile fabric upon one or both surfaces of which a continuous film is formed which film is capable by means of heat and/or pressure or other softening medium of being welded or fused to a superimposed textile fabric or other sheet.

Whilst this latter form of interlining material has certain advantages, for some purposes it has not proved to be entirely satisfactory, for example it prevents a fabric from breathing and when flexed it sometimes creates an undesirable rustle. Furthermore for some purposes it has the wrong handling qualities.

In the Provisional Specification of co-pending Application No. 2056/57 a novel form of interlining material is described in which a sheet base in the form of fabric or the like carries a discontinuous layer of a synthetic resin in the form of substantially discrete nodules secured to one or both faces of the support sheet by adhesion. The specification further describes a method of forming such an interlining material.

An object of the present invention is to provide a further method of making interlining material as described in the aforesaid Provisional Specification.

According to the present invention interlining material suitable for lamination with textile fabric and like sheet material for the purposes of reinforcing or stiffening the said sheet material is produced by a method which includes the steps of distributing over the surface of the support sheet rounded or ovoidal nodules of a synthetic resin subjecting the nodules to the action of a softening media such that the nodules of resin soften sufficiently to adhere to the supporting fabric or other sheet material to form a discontinuous layer on the supporting fabric or other sheet material so that any porosity the support sheet has is retained.

The synthetic resin used may be thermoplastic or thermosetting.

Where a thermosetting resin is employed heat may be employed to soften the resin to bond it to the supporting sheet and at the same time to bring it to the "A" stage of curing. This is sufficient to cause the nodules to soften and to bind to the support. The completion stage of the cure, namely the "B" stage, is used also to laminate the interlining material with another cloth or other sheet material.

However, for most purposes it is preferred to employ a thermoplastic resin and preferably the resin should be such that it softens and the nodules bind to the support material within about ten seconds at a temperature in the range of 80—180°C. It is in any event undesirable to employ a resin which does not behave in this manner after a maximum period after such application of 30 seconds at 200°C. since this temperature is the safe maximum temperature that can be used without scorching most fabrics.

The nodules can if desired be prepared by first forming clusters of particles in accordance with the method described in co-pending Patent Application No. and then subsequently treating the clusters to complete their coalescence to form finished nodules.

After the nodules have been applied to the cloth, for example by scattering, by using mechanical or by other means, it is subjected to the action of heat which may be applied by passing the cloth or other support over, under or through steam plates or drums or by subjecting the surface of the support to radiant heat, for example by infra-red lamps, or heat may be applied by convection currents or any other suitable means. The degree of heating should be such that the nodules of resin soften so as to be firmly bonded to the supporting surface.

When the supporting sheet is a woven fabric of staple fibre it is preferred to treat the cloth first of all to a raising action so

as to lift the fibres. This prevents the resin from striking through to the reverse side of the material with consequential undesirable results.

After the nodules have been softened the cloth may be passed beneath a drum for pressing the nodules firmly into contact with the cloth and if desired the drum may be cooled, for example by water, so as to produce a rapid chilling action on the nodules to prevent any subsidiary tackiness.

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908217 AMENDED SPECIFICATION

1 SHEET *This drawing is a reproduction of the Original on a reduced scale*